STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

November 10, 2009

CERTIFIED MAIL **7007 2560 0001 4602 8657**

The Honorable Allen J. Balog, Mayor
Mr. Joseph A. Bippus, City Manager
City of Three Rivers
333 West Michigan Avenue
Three Rivers, Michigan 49093

Dear Mayor Balog and Mr. Bippus:

SUBJECT: Preliminary Order to Commence Disinfection of WSSN 06610

The Department of Environmental Quality (DEQ), Water Bureau (WB), provided the city of Three Rivers (City) notice of ongoing concerns related to the presence of total coliform bacteria in the City's public water supply, WSSN 06610, in a letter dated January 30, 2009, and a follow-up Violation Notice issued on February 27, 2009. These two notices were in addition to advice provided by DEQ staff to the City over the past 20 years strongly encouraging the City to continuously disinfect public water supply 06610 in the interest of preventing waterborne disease in your community and maintaining compliance with Michigan's Safe Drinking Water Act, 1976 PA 399, as amended (SDWA).

As the City remains unwilling to voluntarily remedy past total coliform violations, enclosed please find an "ORDER OF DETERMINATION UNDER SECTION 15 OF MICHIGAN'S SAFE DRINKING WATER ACT, PUBLIC ACT 399 OF 1976, as amended, MCL 325.1001 et seq." requiring that the City undertake certain, indentified actions to correct and prevent total coliform contamination in water supply 06610.

The SDWA provides that the City request a public hearing regarding the DEQ's determination. Should the City wish to invoke its right to this public hearing, please contact Ms. Nicole Zacharda, WB Enforcement Specialist, within 30 days of your receipt of this letter and Order. Ms. Zacharda may be reached at 517-241-4115 or zachardan@michigan.gov and will make arrangements for a public hearing to be conducted within the City by DEQ officials.

If the City does not wish to proceed with a public hearing on this matter, then the Order will become final 30 days from the date of the City's receipt as documented via the certified mail receipts for this letter.

Sincerely,

Steven E. Chester
Director
517-373-7917

Enclosure

cc: Mr. Frank J. Baldwin, DEQ
Ms. Carrie Monosmith, DEQ
Mr. Richard Benzie, DEQ
Mr. Greg Danneffel, DEQ

cc/enc: Mr. Mark Glessner, DPS Water Superintendent, City of Three Rivers
Mr. J. Patrick O'Malley, City Attorney
Mr. Kenneth K. Cochran, Commissioner
Mr. Elbert Foster, Commissioner
Mr. Darryl L. Griffith, Commissioner
Mr. Rowdy Keith, Commissioner
Ms. Carolyn McNary, Commissioner
Mr. Earl E. Stark, Commissioner
Ms. Lindsay Howes, City Clerk
Mr. William Creal, DEQ
Mr. Gary Wozniak, DEQ
Ms. Nicole Zacharda, DEQ

STATE OF MICHIGAN

DEPARTMENT OF ENVIRONMENTAL QUALITY

In the matter of:

City of Three Rivers
Public Water Supply
WSSN 06610
_____/

ORDER OF DETERMINATION UNDER SECTION 15 OF MICHIGAN'S SAFE DRINKING WATER ACT PUBLIC ACT 399 of 1976, as amended, MCL 325.1001 et seq.

1. The Michigan Safe Drinking Water Act, 1976 PA 399 (SDWA), as amended, states in Section 15(2):

> The department shall inspect a waterworks system or a part of a waterworks system, and the manner of operation of the system or part. If upon inspection the department determines the waterworks system to be inadequate or so operated as to not adequately protect the public health, the department may order the supplier of water to make alterations in the waterworks system or its method of operation as may be required or considered advisable by the department to assure the public water supply is adequate, healthful, and in conformance with state drinking water standards. If the supplier does not request a public hearing within 30 days after receipt of the order, the order shall be final and binding on the supplier of water. If the department receives a request for a public hearing within the specified 30 days, the public hearing shall be immediately arranged. A supplier of water shall comply with a final order

of the department. MCL 325.1015(2).

2. "Department" as identified in the paragraph above, means the Department of Environmental Quality (DEQ) or its authorized agent or representative. MCL 325.1002(g). The City of Three Rivers (City) is a supplier of water as the owner and operator of a waterworks system (WSSN 06610) that provides water to customers for drinking or household purposes. MCL 325.1102(p) and (t).

3. The DEQ has determined that WSSN 06610 is not operated by the City in a manner adequate for the protection of public health. Specifically, the DEQ has determined that the lack of continuous disinfection by the supplier of water presents an unacceptable risk to public health contrary to the SDWA due to recurring detections of total coliform bacteria.

4. The Part 6 administrative rules promulgated pursuant to the SDWA, 2005 AACS R 325.10601 *et seq.*, establish state drinking water standards and analytical techniques. Specifically, Rule 602 establishes maximum contaminant levels (MCL) for total coliform bacteria.

> (b) For a water supply that collects less than 40 samples per month, the supply is in compliance with the MCL for total coliforms if not more than 1 sample collected during a month is total coliform-positive.

1993 AACS R 325.10602(b).

The City collects less than 40 samples per month.

5. The City has reported more than 1 sample result as total coliform-positive in its waterworks system to the DEQ for 9 monthly reporting periods since 2000; violations are tracked within Exhibit A:

- September 2000
- June 2002
- July 2002

- August 2003
- September 2004
- August 2005
- December 2008
- September 2009
- October 2009

6. The DEQ and its predecessor agency, the Michigan Department of Public Health, has advised the City since 1989 that continuous disinfection is a necessary and prudent solution to protect public health and avoid continued violations of the total coliform MCL and SDWA. Exhibit B.

7. In addition to the Rule 602 violations identified in Paragraphs 4 and 5 above, from 1989 to 2000, the City reported violations of the total coliform MCL on 9 separate occasions: May 1990; September 1993; August 1993; June 1995; November 1995; October 1995; December 1996; September 1999; and June 1999.

8. By letter dated January 30, 2009, the DEQ once again advised the City of Three Rivers of the DEQ's concerns regarding the presence of total coliform bacteria in the public water supply and afforded the City an opportunity to voluntarily commit to permanent disinfection. Exhibit C.

9. While the City did commission a study on the costs and benefits of continuous disinfection, no action has been taken toward implementing any of the suggested alternatives. Exhibit D. Despite past recognition of the need to disinfect the water supply (Exhibit E), the City refuses to do so voluntarily. Exhibit F.

10. As a result of the aforementioned violations of the SDWA and in accordance with the authority granted by Section 15 of that act, THE DEQ HEREBY ORDERS THAT THE CITY shall take the following actions to prevent future violations of the SDWA:

    A. The City shall hire a licensed professional engineer not later than December 1, 2009, tasked with the design of a permanent and approvable water treatment system providing sufficient disinfection of the City water supply.

B. The City will direct the engineer to develop preliminary plans for the water treatment system or an alternative water source not later than December 31, 2009.

C. Before beginning any construction or modification of its water supply system, the City shall apply to the DEQ and obtain a permit in accordance with Section 4 of the SDWA (MCL 325.1004). The permit application shall be submitted not later than January 31, 2010.

D. The City shall ensure that the engineering drawings shall be completed and bids for construction solicited not later than March 31, 2010.

E. Construction of the treatment system shall begin not later than May 31, 2010, with construction completed not later than June 30, 2010.

F. The City shall begin using the water treatment system to permanently provide water containing a free chlorine residual, or chloramines, throughout the entire distribution system by August 1, 2010.

G. The City shall directly employ or otherwise contract with a licensed D-2 operator-in-charge to oversee the water supply treatment system according to SDWA Rule 1905 (R325.11905) and DEQ Operator-in-charge policy (Exhibit G) by November 30, 2009.

H. The City shall conduct all necessary testing and reporting for the completed treatment system consistent with SDWA requirements and shall provide the DEQ with signed monthly operation reports on forms provided by the DEQ. Monthly reports shall be due to the DEQ by the 10th day of the following month, starting September 10, 2010, and monthly hereafter.

I. The City shall submit all reports, work plans, specifications, schedules, or any other writing required by this section to the District Supervisor, WB, DEQ, 7953 Adobe Road, Kalamazoo, Michigan 49009-5025. The cover letter with each

submittal shall identify the specific paragraph and requirement of this Order that the submittal is intended to satisfy.

J. Upon receipt of this order, the City shall use existing emergency chlorination equipment to provide a free chlorine residual throughout the distribution system as interim treatment of the water supply and will continue interim treatment until requirements A. through I., above, are achieved.

11. In accordance with Section 15 of the SDWA, the City may, within 30 days of receipt of this Order, request that a public hearing be held. Absent a request for a public hearing, this Order shall be deemed a final and enforceable legal requirement of the City pursuant to the SDWA. MCL 325.1015(2).

12. In the event a public hearing is requested, notice of the hearing date, time, and location will be posted by the DEQ on the department's Web page and in at least one local newspaper. Subsequent to the public hearing, the DEQ may rescind this Order, reissue this Order with modification, or reissue this Order without modification.

Steven E. Chester, Director
Michigan Department of Environmental Quality

Date: 11-12-09

Total Coliform Rule
Maximum Contaminent Level Violations

MI0006610	THREE RIVERS	
10/1/2009 - 10/31/2009	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SIA	ST VIOLATION/REMINDER NOTICE	11/3/2009
SIE	ST PUBLIC NOTIF REQUESTED	11/3/2009
SOX	ST COMPLIANCE ACHIEVED	11/3/2009
9/1/2009 - 9/30/2009	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SIA	ST VIOLATION/REMINDER NOTICE	10/29/2009
SIE	ST PUBLIC NOTIF REQUESTED	10/29/2009
SOX	ST COMPLIANCE ACHIEVED	10/29/2009
12/1/2008 - 12/31/2008	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SFH	ST BOIL WATER ORDER	12/23/2009
SIE	ST PUBLIC NOTIF REQUESTED	1/15/2009
SOX	ST COMPLIANCE ACHIEVED	12/27/2008
SIA	ST VIOLATION/REMINDER NOTICE	1/15/2009
8/1/2005 - 8/31/2005	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SIF	ST PUBLIC NOTIF RECEIVED	9/22/2005
SIE	ST PUBLIC NOTIF REQUESTED	9/13/2005
SIA	ST VIOLATION/REMINDER NOTICE	9/13/2005
SFM	ST ADMIN PENALTY ASSESSED	9/13/2005
SOX	ST COMPLIANCE ACHIEVED	9/9/2005
9/1/2004 - 9/30/2004	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SIA	ST VIOLATION/REMINDER NOTICE	9/16/2004
SIE	ST PUBLIC NOTIF REQUESTED	9/16/2004
SOX	ST COMPLIANCE ACHIEVED	10/25/2004
SIF	ST PUBLIC NOTIF RECEIVED	10/12/2004
8/1/2003 - 8/31/2003	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SIF	ST PUBLIC NOTIF RECEIVED	9/9/2003
SIA	ST VIOLATION/REMINDER NOTICE	8/15/2003
SOX	ST COMPLIANCE ACHIEVED	8/17/2003
SFH	ST BOIL WATER ORDER	8/12/2003
SIE	ST PUBLIC NOTIF REQUESTED	8/15/2003
7/1/2002 - 7/31/2002	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SIE	ST PUBLIC NOTIF REQUESTED	7/19/2002
SOX	ST COMPLIANCE ACHIEVED	8/5/2002
SIA	ST VIOLATION/REMINDER NOTICE	7/19/2002
SIF	ST PUBLIC NOTIF RECEIVED	8/15/2002
6/1/2002 - 6/30/2002	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SIA	ST VIOLATION/REMINDER NOTICE	7/10/2002
SOX	ST COMPLIANCE ACHIEVED	8/5/2002
SIF	ST PUBLIC NOTIF RECEIVED	8/5/2002
SIE	ST PUBLIC NOTIF REQUESTED	7/10/2002
9/1/2000 - 9/30/2000	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SOX	ST COMPLIANCE ACHIEVED	10/26/2000
SIA	ST VIOLATION/REMINDER NOTICE	10/4/2000
SIE	ST PUBLIC NOTIF REQUESTED	10/4/2000
SIF	ST PUBLIC NOTIF RECEIVED	10/19/2000
6/1/1999 - 6/30/1999	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SIE	ST PUBLIC NOTIF REQUESTED	7/14/1999
SIA	ST VIOLATION/REMINDER NOTICE	6/30/1999
SIF	ST PUBLIC NOTIF RECEIVED	7/15/1999
SOX	ST COMPLIANCE ACHIEVED	7/12/1999
12/1/1996 - 12/31/1996	22 - MCL (TCR), MONTHLY	3100 - COLIFORM (TCR)
SIE	ST PUBLIC NOTIF REQUESTED	1/13/1997
SOX	ST COMPLIANCE ACHIEVED	1/3/1997

11/1/1995 - 11/30/1995	22 - MCL (TCR), MONTHLY		3100 - COLIFORM (TCR)
	S I A	ST VIOLATION/REMINDER NOTICE	1/17/1996
	S I E	ST PUBLIC NOTIF REQUESTED	1/17/1996
	S O X	ST COMPLIANCE ACHIEVED	11/30/1995
10/1/1995 - 10/31/1995	22 - MCL (TCR), MONTHLY		3100 - COLIFORM (TCR)
	S O X	ST COMPLIANCE ACHIEVED	11/2/1995
	S I A	ST VIOLATION/REMINDER NOTICE	1/17/1996
	S I E	ST PUBLIC NOTIF REQUESTED	1/17/1996

STATE OF MICHIGAN

JAMES J. BLANCHARD, Governor

DEPARTMENT OF PUBLIC HEALTH

3423 N. LOGAN
P.O. BOX 30195, LANSING, MICHIGAN 48909

Raj M Wiener, Director

September 18, 1989

City of Three Rivers
333 West Michigan Avenue
Three Rivers, Michigan 49093

6610

Attention: Mr. Maurice Evans, City Manager

Subject: Water Supply - Three Rivers

Dear Mr. Evans:

This letter confirms our meeting on September 13, 1989 to discuss the bacteriological monitoring program in Three Rivers. During the past summer months, the analyses of some of the samples collected from various locations in the city's water distribution system have reported the presence of coliform bacteria. Other analyses that didn't detect coliform present did report evidence of increased microbiological activity. Because the results have been sporadic, no obvious pattern identifying a possible source of this problem has been evident, and no violation of the microbiological drinking water standard for coliform organisms has occurred.

In August, a check sample collected at M-60 and Blossom Drive did confirm coliform present at that sampling location. The city was then contacted on August 28 asked to collect samples from throughout the distribution system to determine the extent of the contamination. The subsequent monitoring reported two positive coliform analyses (unsafe analyses) from other locations in the distribution system, and six safe analyses, including a sample from M-60 and Blossom Drive.

Based on these results, indicating a continuing, sporadic problem in the distribution system, we again contacted the city (on September 6, 1989) and asked that chlorination of the distribution system be initiated as a precautionary measure. However, the Department of Public Works asked that they be allowed to conduct one more additional round of monitoring in order to clarify the nature and extent of any microbiological contamination. They informed us of the city ordinance that prohibited them from disinfecting the water supply unless specifically ordered to do so by the Michigan Department of Public Health.

It was agreed that the city would collect twenty-four samples and deliver them to two laboratories that day. It was further agreed that if more than one of these samples reported coliform present, chlorination of the water supply would be instituted immediately. On September 7, nine of twelve samples delivered to

our laboratory reported safe results, with the three remaining samples being submitted to further confirmation testing. On September 8, all twelve samples submitted to a private certified laboratory in Kalamazoo reported safe analyses. On September 11, two of the three samples submitted to further confirmation in our laboratory reported safe results, with the remaining sample reporting the presence of 1 coliform organism per 100 milliliters.

Because twenty-three of twenty-four analyses were safe, we did not order the city to chlorinate. However, as we discussed during our meeting, the increased and unusual microbiological activity evident in the Three Rivers water distribution system during the past several months was reason enough for us to strongly recommend that the city disinfect the distribution system by practicing continuous chlorination.

During our meeting, we also discussed reasons why the city's water supply may be having this problem. One possible source is the recent construction of water mains that have been added to the system that may not have been completely disinfected prior to being placed in service. Another possibility is the addition of a new well to the system that likewise, may not have been completely disinfected. Other potential sources of contamination and/or increased bacterial activity include:

1. System maintenance and repairs (well and tanks maintenance, valve and hydrant repairs, water main breaks, etc) that may not have been successfully disinfected.

2. Cross connections within customers' plumbing that may allow unsafe water to backflow into the city's distribution system.

3. A pressure loss in all or part of the distribution system that may allow unsafe water surrounding underground piping to enter through leaks that normally result in water loss.

4. Unauthorized or improper plumbing alterations or additions in any one of the thousands of city customers' buildings that were not properly disinfected before the city water system was connected.

You can see that your city's water supply is susceptible to a significant number of potential sources of contamination. The larger your distribution system, the more vulnerable your system becomes.

To reduce this vulnerability and better control the quality of the water delivered to the customers' tap, the Division of Water Supply strongly supports the practice of continuous chlorination as a preventative public health measure. If the city of Three Rivers were to maintain a continuous chlorine residual in the distribution system, it is likely that the Department of Public Works would be able to control and eliminate most of the problem caused by the items listed above before any significant or system-wide public health threat develops. Without this on-going disinfection, it is likely the city would not be able to prevent a problem, but have to react after the fact to correct and eliminate it.

When a water supplier is reacting to a contamination problem after the fact, more drastic actions may be necessary, such as shock chlorination and boil water advisories. From our experience, boil water advisories create extreme difficulties, and leave the water supplier with severely damaged public relations. The impact of an advisory to boil water for drinking and cooking purposes while the city attempts to correct a contamination problem can result in the curtailing of operations at schools, hospitals, nursing homes, restaurants, food processing facilities, bottling plants, etc. Continuous chlorination providing proper disinfection of the water distribution system will provide the water supplier with the best available protection against having to employ such drastic measures.

While the city of Three Rivers water supply has not reached the point of having to shock chlorinate or issue a boil water advisory, we still believe it would be in the city's best interest to disinfect the water distribution system.

While the city should be aware of the likelihood that it will have to continuously chlorinate the water supply in the near future, we do not believe this fact should be the primary reason for the city to act, now. Hopefully, the discussion and explanation presented in this letter provides the city with the justification to initiate this proven, preventative public health measure. We also feel that the city should not restrict the Department of Public Works from exercising its judgment when evidence mounts that chlorination should be used. Anytime chlorination is necessary, the Department of Public Works will be consulting with this office.

In summary, the city of Three Rivers water supply has recently shown evidence of increased microbiological activity without displaying a definitive pattern that identifies any one potential source. Although the system has not violated any current drinking water standard, we strongly recommend the city seriously consider employing continuous chlorination as a long-term, preventative measure.

As discussed during our meeting, we can attend council meetings or other forums for further discussions of this issue. If you should have any questions about these issues, please contact me at (517) 335-8305.

Sincerely,

Richard E Benzie

Richard E. Benzie, P.E.
District Engineer
Division of Water Supply
Bureau of Environmental and
Occupational Health

REB:dg
cc: Mr. Thomas Tarkiewicz, P.E., Public Works Director
cc: Branch-Hillsdale-St. Joseph District Health Department

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF PUBLIC HEALTH

3423 N. MARTIN L. KING JR. BLVD.
P.O. BOX 30195, LANSING, MICHIGAN 48909
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
VERNICE DAVIS ANTHONY, MPH, Director
James R. Haveman, Jr., Acting Director

January 17, 1996

Mr. Mark Glessner
City of Three Rivers
1015 South Lincoln Avenue
Three Rivers, Michigan 49093

6610

Subject: Water Supply - Three Rivers
Total Coliform Positive Analyses

Dear Mr. Glessner:

It has recently come to our attention that the city of Three Rivers received Total Coliform (TC) positive analyses from numerous samples collected during October and November of 1995. From a review of these results, it is apparent that both of these incidents were a violation of the maximum contaminant level (MCL) for total coliform. For your information, a violation occurs any time a water supply that collects less than 40 samples per month receives two total coliform positive analyses in the same monitoring period.

In response to these MCL violations, the city should have notified us immediately after receiving the second positive analysis in each of these monitoring periods (October & November). At that time, we would have discussed appropriate corrective action and response measures, such as emergency chlorination, a boil water advisory, public notification, system-wide flushing and additional sampling schedules. In addition, information about these MCL violations should have been publicized in the local news media within 14 days and mailed directly to each customer within 45 days. Although now delinquent, the city still needs to comply with the public notification requirement as soon as possible.

According to city records, all samples collected since November 15, have reported acceptable results. Since the problem is no longer evident and apparently corrected, direct mailing of the public notice will be waived. Enclosed with this letter is a sample public notice for use in the local newspaper. The indented portion of this example contains mandatory health effects language that cannot be altered. Please provide this office with a copy of the final notice used by the city.

It is imperative for the city of Three Rivers to become familiar with the requirements for bacteriological sampling as well as the required response actions when results indicate a possible problem. In June of 1995, the city experienced a similar incident in which both an MCL and a

monitoring violation occurred due to repeated coliform positive analyses and insufficient resampling. In October and November 1995, adequate repeat samples were collected but required and recommended response measures were not instituted. In the future, the city may want to contact this office anytime a coliform positive sample is obtained. It will provide an opportunity to discuss reasons for a possible positive analysis (recent construction activity, loss of system pressure, recent maintenance on wells or storage tanks, etc.). It also establishes a communication link for discussing the results of the repeat samples and any precautionary measures deemed necessary. In any event, the city is required to notify us immediately if a fecal coliform (or E. Coli) positive analysis is obtained, or if an MCL violation occurs (two TC positive analyses in one month).

As an unchlorinated water supply, Three Rivers is especially susceptible to bacteriological contamination. If we cannot avoid repeating these contamination events, the city will need to institute continuous chlorination of the water supply. To discuss these issues further and to clarify any other matters regarding the routine monitoring requirements of the city, we have scheduled a meeting in Three Rivers for January 18. Please contact Dianne Holman at (517) 335-9609 or me at (517) 335-8305 if you should have any questions.

Sincerely,

Richard E. Benzie, P.E.
Supervising District Engineer
Division of Water Supply
Bureau of Environmental and
Occupational Health

REB:lw
Enclosure
cc: Branch-Hillsdale-St. Joseph District Health Department
cc: Martha Koby

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
KALAMAZOO DISTRICT OFFICE

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

October 29, 2003

Mayor and Commission
City of Three Rivers
333 West Michigan Avenue
Three Rivers, Michigan 49093-2193

WSSN: 6610

ATTENTION: Mr. Joe Bippus, City Manager

Dear Messrs. and Mmes.:

SUBJECT: Municipal Water Supply Chlorination

Thank you for allowing me to speak at the city of Three Rivers (City) Commission meeting on October 7, 2003, regarding water supply chlorination. Enclosed is my presentation outline for your information.

As we discussed in the meeting, the Department of Water Quality, Water Division, supports the use of free chlorine residual in drinking water to help prevent the possibility of waterborne disease transmission. Please call if you have any questions, or if we can be of assistance in helping the City determine water treatment options.

Sincerely,

Gary A. Wozniak, P.E., District Engineer
Field Operations Section
Water Division
Kalamazoo District Office
269-567-3613

GAW:DMS

Enclosure

cc: Mr. Jim Tolfree, Water Quality Specialist, City of Three Rivers
Branch-Hillsdale-St. Joseph Community Health Agency

JENNIFER M. GRANHOLM
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
KALAMAZOO DISTRICT OFFICE

STEVEN E. CHESTER
DIRECTOR

January 30, 2009

CERTIFIED MAIL

WSSN: 06610

Mr. Allen Balog, Mayor
City of Three Rivers
333 West Michigan Avenue
Three Rivers, Michigan 49093

Commissioners
City of Three Rivers
333 West Michigan Avenue
Three Rivers, Michigan 49093

ATTENTION: Mr. Joseph Bippus, City Manager

Dear Mayor Balog and Commissioners:

SUBJECT: Water Supply

The Department of Environmental Quality (DEQ), Water Bureau (WB), is concerned that the number and frequency of drinking water coliform standard violations occurring in the City of Three Rivers (City) water supply may warrant additional public health protection. A recent history of coliform standard violations and the possible causes, if known, include:

In September 2000, water samples confirmed total coliform bacteria in the distribution system, but our records do not show a possible cause of contamination.

In June of 2002, and July of 2002, samples confirmed total coliform bacteria in the water distribution system near the public works building. Again, a possible source of the contamination was not found.

In August of 2003, total coliform bacteria were widespread throughout the City system. Source contamination was also confirmed and it was discovered the well screen vents were not intact and millipedes were abundant in the well houses, providing a possible source for contamination.

In September of 2004, total coliform bacteria were detected in areas surrounding new water main construction activities. According to the City water quality specialist, the water main contractor had problems isolating the newly constructed main during pressure testing and disinfection.

In August of 2005, repeat samples confirmed total coliform bacteria in the water distribution system, but a possible cause was not found.

In December of 2008, the water system experienced a brief but total loss of system pressure. After a well control problem was immediately fixed, follow-up water samples indicated the presence of total coliform in the distribution system.

The Michigan Safe Drinking Water Act, 1976, PA 399, as amended (Act 399), §Sec. 15. (1) states *"When considered necessary for protection of public health, the department shall notify a supplier of water of the need to make changes in operations, to provide treatment, to make structural changes in existing systems, or to add additional capacity as necessary to produce and distribute an adequate quantity of water meeting the state drinking water standards."* The DEQ is hereby notifying the City that the number and frequency of total coliform standard violations are numerous, and the City must make changes to the water treatment system to prevent future coliform standard violations. Please provide for a plan to provide the adequate treatment of the water supply that will provide continuous protection of public health by **April 30, 2009**. Most Michigan water supplies achieve adequate water treatment by disinfecting with chlorine. Conversion of emergency chlorine equipment to provide continuous chlorine residual will require a construction permit from this department.

We are currently updating the City water system evaluation, and will forward our evaluation summary and recommendations under separate cover. If you have any questions, please call.

Sincerely,

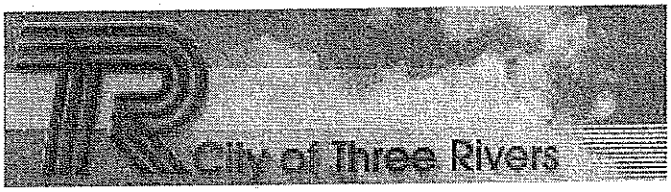
Gary A. Wozniak, P.E., District Engineer
Kalamazoo District Office
Field Operations Division
Water Bureau
269-567-3613

GAW:DMS

cc: Mr. Jim Rozeboom, Director of Public Services, City of Three Rivers
Branch-Hillsdale-St. Joseph Community Health Agency

Public Water Supply

Disinfection/Fluoridation Study



City of Three Rivers, Michigan

2009

Submitted by:

Jones & Henry Engineers, Ltd.
4791 Campus Drive
Kalamazoo, Michigan 49008

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LIST OF ATTACHMENTS

EXECUTIVE SUMMARY

The City of Three Rivers has experienced total coliform bacteria in the water distribution system (7) times since 2000. As the City does not continuously disinfect the water supplied to its residents, there has been a desire over the years to determine if the City should disinfect the finished water it provides its residents and businesses. This study has reviewed background data associated with this issue, and has provided recommendations in that regard.

It is acknowledged that the Michigan Department of Environmental Quality (MDEQ) has expressed concern over the reports of coliform bacteria in the City's water distribution system, and has prompted the City to look closely at the possibility of adding a disinfectant to their system, providing the impetus for this study. Fluoridation is also another consideration of this study, as it relates to the dental health of the City's customer base.

The MDEQ recently requested that the City develop a "plan to provide adequate treatment of the water supply that will provide continuous protection of public health." Recent "boil water" notices have been negatively perceived by certain City businesses and residents, leading to this most recent request from the MDEQ.

This report notes that disinfection equipment exists in the City's well houses as a "backup" system in case of an emergency, as the City historically has had limited interest in permanently disinfecting its drinking water. Although a simple and straightforward method to addressing MDEQ's concerns would be converting the backup disinfection systems to a permanent system, there are pro's and con's of converting the system. The pro's or positives are that the continuous disinfection requirement is met, and water customers may anticipate fewer boil water notices in the future.

An opposing argument may be that communities that continuously disinfect also issue boil water notices when system pressure falls due to a water main break or similar cause. There may, in fact, be no imminent threat to the water customers when this occurs, but the boil water notice is issued regardless.

The same scenario may or may not be the case in Three Rivers on the rare occasions of coliform bacteria in the drinking water. When this occurs, the City issues a boil water notice and proceeds to immediately disinfect the raw water supply. This methodology has worked in the past, and is not necessarily a poor approach.

Further, of the (7) coliform incidents in the past 10 years, (3) are attributed to known causes, leaving (4) to unknown causes. In a sense, the City has had 0.4 (unknown as to cause) coliform issues per year for the past 10 years. Is this amount "numerous" as MDEQ contends? A fair analysis would have to be made by comparing this frequency to other communities, most of which disinfect continuously with chlorine.

Ultimately it is the City's decision to determine what level of disinfection (and fluoridation) to provide its customers, as long as the City meets the terms of Michigan's Safe Drinking Water Act. Three Rivers has a proven record of demonstrating that continuous disinfection is not "absolutely" required to provide quality drinking water to its customers. The situation whereby the City and MDEQ work closely to continue to monitor the system in regards to "unknown" causes of contamination should continue to proceed for an agreed upon period, after which time a long-term plan can be implemented.

INTRODUCTION

The City of Three Rivers is centrally located in St. Joseph County, Michigan near the confluence of the St. Joseph River with its tributaries the Rocky and Portage Rivers; from which the City derives its name. The City was founded in 1830, as a farming community and continues to have strong ties to the surrounding agricultural areas. The purpose of this report is to present in detail the current state of the City's Public Drinking Water System (PDWS) in regards to recent concerns related to the disinfection of the ground water entering the system. The City's general topography ranges from 760-ft to 820-ft NGVD. The City's 2007 population was estimated to be 7,219 persons; slightly down from the 2000 estimate of 7,328 by the US Census Bureau.

Distribution System Overview

A community develops a water distribution system to supply sufficient quantities of potable water at adequate pressure to its utility customers. The components of distribution vary from system to system, but the basic operation and elements of the water works are common to nearly all systems; potable water is pumped from a well field or treatment plant through a network of interconnected mains to the users. The precise manner and routes by which water is conveyed to the user depend on the hydraulic configuration of the distribution network. System hydraulics is an aspect of engineering design influenced by high service and booster pumps; elevated and ground storage tanks; control valving; the size and condition of the water lines and the specific water demand within the system.

A water distribution system must meet the residential and industrial needs of a community every day while maintaining sufficient reserve capacity for filling tanks and fighting fires. If water demand were constant, meeting system requirements would be fairly simple; however, demand varies with the time of day, week, and year. For example, maximum-daily and maximum-hourly demands are commonly 1.5 and 2.5 times the average-daily use, respectively. Fires, water line breaks and other special events also increase demand.

Variations in water use complicate system hydraulics and necessitate careful selection of distribution methods and components to meet overall system requirements. The selection of distribution methods also is influenced by local conditions, such as topography; status of the existing network; location of pumping facilities with respect to major users; size, development and service area of the community and utility operating policy.

Pump-storage is the general distribution method used by the City of Three Rivers. This method utilizes a combination of pumps and elevated storage to meet the consumption and fire requirements of the system. During periods of low consumption, water is pumped into the elevated storage. During periods of high consumption, the stored water is used to augment the water being pumped to users by the City's well field pumps.

Many communities use elevated storage in areas of high consumption and low pressure to increase local pressures without adding mains or changing pumps. The stored water is used during the day and replaced at night when water use and energy costs are lower. The system currently utilized by the City is extremely cost effective with respect to water pumping costs.

EXISTING WATER SYSTEM

The water service area is bound by the City Limits which have been extended recently to include Well #8. The City currently has the ability to serve areas generally to the west and north or other growth areas in the future due to having excess capacity at this time.

The Water System consists of the following basic components:

Table 1
Primary System Components

5 Wells In 3 Separate Well Fields	*Well Located on Private Property (to be Abandoned in 2017)*	Well #4
	Primary Well Field (Located Near the Rocky River)	Well #5
		Well #6
		Well #7
	Well Located East of the City off M-60	Well #8
	Firm Well Capacity (Well #4 Offline)	**2,217 gpm**
Storage Infrastructure	Elevated Storage Tank with a Capacity of 500,000 gallons	
	Ground-Level Storage Tank (Currently Unused)	
Distribution System Piping[1]	6,400 lineal feet	4-inch main
	128,600 lineal feet	6-inch main
	31,200 lineal feet	8-inch main
	19,000 lineal feet	10-inch main
	32,800 lineal feet	12-inch main
	1,000 lineal feet	14-inch main
	21,600 lineal feet	16-inch main
	Total Lineal Feet of Water Main – 4 to 16-inches	**240,600 feet**

[1] *Water System Reliability Study* (Draft), Wightman & Associates, Inc., 2002.

Existing Wells

The City currently owns and operates five (5) groundwater wells in various locations throughout the City. Although the wells currently produce more than adequate supplies of water for the City's system, there have been some concerns both in the past and more recently related to the isolation of the wells, their security, the quality of water produced and most importantly the status of the disinfection equipment.

The Michigan Department of Environmental Quality (MDEQ) has expressed past concerns about the lack of well field protection areas around some of the wells; especially Well #4, which is located on private property that is leased by the City.

Water Storage System

The City currently has two primary systems for water storage and pressure stabilization: a 500,000 gallon elevated storage tower, and a ground-level storage tank which is currently not in use. The elevated storage tank was constructed in 1964 and is generally considered to be in good overall shape as the City has maintained its coating system and had regular inspections of the tower.

Water Supply

The City owns and operates its own drinking water wells, which currently meet the water requirements of the residents and businesses of Three Rivers. There are a total of 3 well fields with a total of 5 individual wells in varying degrees of aging and condition that the City maintains as part of its water supply infrastructure.

The Three Rivers Public Utilities Department operates and maintains the City's public water system and records daily water usage. Copies of recent flow data have been reviewed and in general the average daily flow (ADF) is around 1.2 MGD with peak flows of around 2.5 MGD (approx 1700 GPM). According to the latest Water System Reliability Study (completed by Wightman & Associates, Inc. in 2002), the firm pumping capacity of the City's wells is 2,217 GPM with Well #4 offline.

The City recently installed a new test well (Well #9) near the City's Wastewater Treatment Facility. This test well will eventually be brought online following the test period as a replacement for Well #4 which is scheduled to be abandoned in 2017.

RECENT EVENTS

There have been certain recent events that have illustrated the City's vulnerability to bacteriological (coliform bacteria) contamination of their water supply. This is a concern to both the City overall and its water customers. The presence of coliform bacteria in a public water supply is taken to be an indication of a presence of pathogens. It is utilized as an indirect evidence method for the determination of the possible presence of pathogens in drinking water.

Coliforms come from the same sources as pathogenic organisms. Coliforms are relatively easy to identify, are usually present in larger numbers than more dangerous pathogens, and respond to the environment, and water treatment similarly to many pathogens. As a result, testing for coliform bacteria can be a reasonable indication of whether other pathogenic bacteria are present.

The following is a chorological record of the more recent water contamination events[2]:

- September 2000, water samples confirmed total coliform bacteria in the distribution system, the source or cause of the contamination was not undetermined.
- June of 2002, and July of 2002, samples confirmed total coliform bacteria in the water distribution system near the public works building. Again, the source or cause of the contamination was not undetermined.
- August of 2003, total coliform bacteria were widespread throughout the City system. Source contamination was also confirmed and it was discovered the well screen vents were not intact and millipedes were abundant in the well houses, providing a possible source for contamination.
- September of 2004, total coliform bacteria were detected in areas surrounding new water main construction activities. According to the City's water quality specialist, the water main contractor had problems isolating the newly constructed main during pressure testing and disinfection procedures.
- August of 2005, repeat samples confirmed total coliform bacteria in the water distribution system, but a possible cause was not found.
- December of 2008, the water system experienced a brief but total loss of system pressure. After a well control problem was immediately fixed, follow-up water samples indicated the presence of total coliform in the distribution system.

Following these total coliform bacteria standard violations, the MDEQ issued a letter in January of this year (see **Attachments**) to the City requiring them to develop a plan to provide for the continuous protection of public health as related to their water system. The commissioning of this report is a direct result of that letter.

The issues surrounding the City's non-use of disinfection equipment/procedures can be traced much further back and was a specified recommendation of the "*Well Evaluation Update*" completed by Jones & Henry in 1994.

[2]Michigan Department of Environmental Quality Letter dated: January 30, 2009.

OVERVIEW OF DISINFECTION METHODS

There are many types of disinfection systems in use in U.S. municipal water systems; among these are chlorine, ultraviolet (UV) light and ozone. The following is a brief overview of these more popular disinfection methods.

Chlorine

By far the most common disinfection method in the U.S., hypochlorite (or other forms of chlorine) has proven itself as a cheap and safe water disinfection method. For decades, chlorine has played an important role in water treatment. Chlorine is the most widely applied disinfectant. The advantages of chlorine are that it is easily produced, relatively inexpensive, and effectively kills pathogens.

Chlorine-based disinfectants have played a critical role in protecting America's drinking water supply from waterborne infectious diseases for nearly a century. While chlorine's most important attributes are its broad-spectrum germicidal potency and persistence in water distribution systems, its ability to efficiently and economically address many other water treatment concerns has also supported its widespread use. Chlorine-based compounds are the only major disinfectants exhibiting lasting residual properties to provide continual protection against microbial re-growth.

Chlorine-based chemicals are the disinfectants of choice for treating drinking water. In fact, some 98% of all systems that disinfect their water employ chlorine-based disinfectants. Chlorine-based disinfectants are available as a gas, sodium hypochlorite solution or solid calcium hypochlorite. Chlorine dioxide is another very strong chlorine-based disinfectant that has been shown to be effective against virtually all forms of microbial growth in drinking water. As yet, little is known about the affects of chlorine on viruses, but some authorities place them at neither extreme in resistance to chlorination.

Municipalities utilize chlorine because it does its job extremely well, is safe to use when handled properly and is very cost effective. The primary advantages of a chlorine-based disinfection system are the low cost of installation and operation/maintenance as well as the residual of free chlorine that is provided to achieve a level of security concerning contamination events. As with any disinfection method there are some disadvantages as outlined below.

- Chlorine in drinking water has been linked to a number of health problems
- Since mid-1970s, formation of trihalomethanes as a result of chlorination of natural waters has been documented
- Trihalomethanes are possible human carcinogens as characterized and pose a potential human health threat; however they are not commonly associated with groundwater treatment
- In addition, people often dislike the taste and smell of chlorinated water

Europe uses alternative disinfectants for drinking water disinfection; France, for example, mainly uses ozone. Italy and Germany use ozone or chlorine dioxide as a primary oxidant and disinfectant; chlorine is added for residual disinfection. Great Britain is one of few European countries that use chloramines for residual disinfection in the distribution network and for the removal of disinfection byproducts.

Ozone

Ozone is a form of oxygen with the molecular formula O_3. It forms when O_2 or clean dry air is exposed to a powerful electric current. In nature, it forms in the upper atmosphere when lightning passes through the air. Ozone is unstable and changes to O_2 shortly after its formation. It is a powerful oxidant and one of the most powerful disinfectants available in water treatment.

Ozone is a highly unstable molecule with a relatively short half-life. It must therefore be generated on-site. Ozone can be generated from any source of gas which contains oxygen molecules. The clean, dry gas passes through a chamber with a high voltage electric current which discharges electrons into the air. The gas is then injected in the water passing through the system and solubilized. The amount of ozone in the system can be regulated in the generator by adjusting the voltage of the current or the flow rate of the gas.

The ozone-enriched water flows into a chamber to allow for sufficient contact time. During this contact time, ozone molecules decay to form oxygen molecules and free hydroxyl radicals. It is both the ozone and the highly reactive free radicals which oxidize organic molecules. Through this oxidation, toxic herbicides and pesticides are reduced to more environmentally friendly components. Non-biodegradable organics will reduce to smaller biodegradable parts. Since the free hydroxyl is so highly reactive, the contact time necessary is minimal, as compared to other disinfectants.

Ozone has an average half-life of 20 minutes if it is not oxidized by particulates. Depending on the water quality at a given time, a portion of the dissolved ozone may pass through the system unoxidized. Ingestion of ozone is a serious concern because of its strong oxidizing capabilities. Safety precautions are usually taken to insure that the remaining ozone molecules are destroyed before they reach the distribution system.

Bromate is formed when ozone that is used to disinfect drinking water reacts with naturally occurring bromide found in source water. Bromate formation in disinfected drinking water is influenced by factors such as bromide ion concentration, pH of the source water, the amount of ozone and the reaction time used to disinfect the water. The U.S. Environmental Protection Agency developed a level that it considers protective of non-cancer health effects from long-term exposure, including individuals who may be more susceptible including women of childbearing age and children.

Ozone has proved itself as a safe and effective disinfection method in Europe and has been used for many years in some of the larger European countries such as France and Germany. As with any disinfection method there are pros and cons to the use of ozone as described in the following table.

Table 2
Disinfection with Ozone – Pros and Cons[3]

Pros	Cons
Extremely powerful disinfectant for waterborne pathogens	Expensive disinfection option
Does not form trihalomethanes as the use of chlorine does	Can form other hazardous disinfection-by-products such as bromate and the residual levels of ozone in the water must be carefully controlled
Requires relatively short contact time required to achieve disinfection	Requires a high level of technology in the production and control of the ozone injected into the water
Reduces taste, odor, and color in water by oxidizing the algae, microbes and humic (organic) material which causes these problems	Requires another disinfectant to achieve residual disinfection levels
Forms microfloc upon contact therefore improving coagulation and reducing the required coagulant dose (only a benefit is water treatment procedures are in use)	Highly unstable and therefore must be generated on-site
Can improve filtration rates. With improved coagulation, more material settles in the sedimentation basin. Hence, less material reaches the filters and the filters can be run longer before backwashing (again, only a benefit is water treatment procedures are in use).	Climate control needed to maintain solubility which can be difficult to achieve at multiple sites. Ozone disinfection is much more geared towards a centralized disinfection system.
Environmentally friendly as the ozone quickly decays back to oxygen	Ozone is not widely used in U.S. and there is some skepticism on the part of the public and the regulatory agencies on its use.

[3] *Disinfection with Ozone*, by Stacie Kramer and Susanna Leung.

Ultraviolet (UV) Light

Unlike chlorination, ultraviolet (UV) irradiation processes pose no known carcinogenic disinfection by-products and produces no tastes or odors. Researchers are exploring safe alternative drinking water disinfectant treatments.

Using ultraviolet (UV) light for drinking water disinfection dates back to 1916 in the U.S. Over the intervening years, UV costs have declined as researchers develop and use new UV methods to disinfect drinking water. Currently there are several states in the U.S. that have developed regulations that allow systems to disinfect their drinking water supplies with UV light. Running a UV light system requires a basic level of operator skill and relatively clean source water (i.e. well water). On the down side, however, UV offers no residual disinfection within the distribution system and most municipalities still utilize chlorine to some affect to produce a residual in their distribution system.

Advantages

Generally, UV is simple to install and requires little supervision, maintenance, or space. Improved safety, minimum service time, low operation and maintenance costs, and the absence of a chemical smell or taste in finished water are primary factors for selecting UV technology rather than traditional disinfection technologies. UV treatment breaks down or removes some organic contaminants. The advantages of using UV, rather than chemical disinfection, include:

- Has no known toxic or significant nontoxic byproducts
- Has no danger of overdosing
- Removes some organic contaminants
- Has no volatile organic compound (VOC) emissions or toxic air emissions
- Has no onsite smell and no smell in the final water product
- Requires very little contact time (seconds versus minutes for chemical disinfection);
- Does not require storage of hazardous material
- Requires minimal space for equipment and contact chamber
- Improves the taste of water because of some organic contaminants and nuisance microorganisms are destroyed
- Does not affect minerals in water and it has little or no impact on the environment except for disposing of used lamps or obsolete equipment.

Limitations

Microbial and chemical characteristics are two major water quality factors that can affect the UV unit's performance and the overall effectiveness of a UV disinfection system. Microbial characteristics of water include type, source, age, and density, while the chemical water characteristics of importance include nitrites, sulfites, **iron, hardness**, and aromatic organic levels. UV radiation is not suitable for water with high levels of suspended solids, turbidity, color, or soluble organic matter as these materials can react with UV radiation, and reduce disinfection performance. The primary disadvantages of UV disinfection include:

- No disinfection residual is produced and the use of chlorine to produce a residual may still be necessary
- No technical database exists on how well UV systems perform for various water quality conditions
- There are currently no standardized procedures that calibrate or certify how well the equipment will work before installation (regulatory agencies are still hesitate to approve UV systems)

Systems also should consider using different kinds of microbial testing. Laboratories typically test for total coliform to judge microbiological activity in drinking water, but coliforms are sensitive to UV light. Due to this sensitivity, microbial tests for UV treated finished water should include a Heterotrophic Plate Count (HPC) test, which can be a costly test. HPC microorganisms may provide a better disinfection assessment than the UV sensitive coliforms, but will also generally increase the cost for a municipality's microbiological testing.

FLUORIDATION

Water fluoridation is the controlled addition of fluoride to a public water supply to reduce tooth decay; thus fluoride addition can be achieved by various injecting various fluoride containing chemicals into the water. Fluoridated water has fluoride at a level that is effective for preventing cavities; generally taken at 0.6-1.0 mg/L. Fluoridated water operates on tooth surfaces: drinking it creates low levels of fluoride in saliva, which reduces the rate at which tooth enamel demineralizes and increases the rate at which it remineralizes in the early stages of cavities.

Although water fluoridation can cause dental fluorosis, which can alter the appearance of developing teeth, most of this is mild and with adequate monitoring of the levels of fluorine being added to the water it is usually not considered to be of an aesthetic or public-health concern.

Fluoridation of the public water supply is the most equitable, cost-effective, and cost-saving method of delivering fluoride to the community. In the United States during 2000, approximately 162 million persons (65.8% of the population served by public water systems) received optimally fluoridated water compared with 144 million (62.1%) in 1992[4].

Given the proven benefits of the controlled addition of fluorine to the public drinking water supply and its long history of safety in regards to public health, it is recommended that the City pursue the construction of a fluoridation system in conjunction with the planned disinfection system.

[4]D. Apanian, MS et al., Div of Oral Health, *National Center for Chronic Disease Prevention and Health Promotion*, CDC.

PROPOSED DISINFECTION/FLUORIDATION SYSTEM

Due to the widespread area of the City's existing wells and the current configuration of the distribution system, it is thought that a centralized disinfection system that would link all of the City's wells to a combined treatment area would be unduly expensive to construct.

As such, the use of ozone for disinfection is not feasible considering the large investment cost of the ozone production/delivery systems. Furthermore, the use of ozone generally requires the use of a secondary disinfection method to produce a residual (to maintain a level of microbial resistance) in the water flowing into the distribution system. Achieving a residual in the water is achieved primarily by the use of chlorine in one form or another; thereby the use of chlorine, albeit at a reduced level, is still necessary in many cases.

Disinfection using ultraviolet light is still gaining popularity among the regulatory agencies, and its use is becoming more widespread in some areas of the country. The primary reason this disinfection method is not considered feasible for the City's system is the high levels of iron (0.6-1.0 ppm) and hardness found in the City's well water. It is anticipated that these naturally occurring chemicals would require a pre-treatment (settling) system prior to the use of UV for the disinfection of the water pumped into the distribution system. This is an undue cost that the City would have to bear along with the probable installation of a secondary chlorine disinfection system that would likely be required to provide a residual.

These aspects have led to the preliminary recommendation of a permanent chlorine disinfection/fluoridation system for the City's public water system, if the City desires to move in this direction. Chlorine in one form or another is utilized by approximately 98% of the nation's municipal drinking water systems for disinfection. Properly installed, operated and maintained, chlorine-based municipal drinking water disinfection systems have proven themselves for communities of varying sizes and water sources.

The City currently has chlorine disinfection systems in place in 4 of their 5 wells, which are used for emergencies or perceived contamination threats. This method of operation has in general, been effective in providing disinfection of the water system with a few glitches, which are evidenced by the past occurrences of total coliform bacteria in the system. The MDEQ is now suggesting additional disinfection measures, which may ultimately take the form of a permanently operated disinfection system. The installation and following operation/maintenance of a chlorine-based disinfection system is seen as the least costly alternative as well as the most robust system available for the wells that the City currently sources its water from.

The proposed disinfection system (whether chlorine-based or otherwise) must be a individual site type of system for the two outlying wells (#4 & #8); in that each of these wells will need to be equipped with its own complete disinfection system capable of providing disinfection at the source of the pumped well water. This is anticipated to be the most cost effective disinfection strategy for the City considering its widespread well fields (#4 & #8). Of the disinfection methods discussed a chlorine-based system best lends itself to an individual well site disinfection system. Please see **Figure 1** for a preliminary layout of a typical well site disinfection system. As mentioned, the disinfection systems eventually installed at the outlying wells will be individual well site type systems that will be sized for each well based on its rated/actual pumping capacity.

For the larger wellfield that encompasses wells #5, #6 & #7 a more centralized disinfection system is proposed, given these wells' close proximity to each other. This would entail the installation of a small pre-fabricated building to house the disinfection equipment. Please see **Figure 2** for a preliminary layout of the proposed disinfection building.

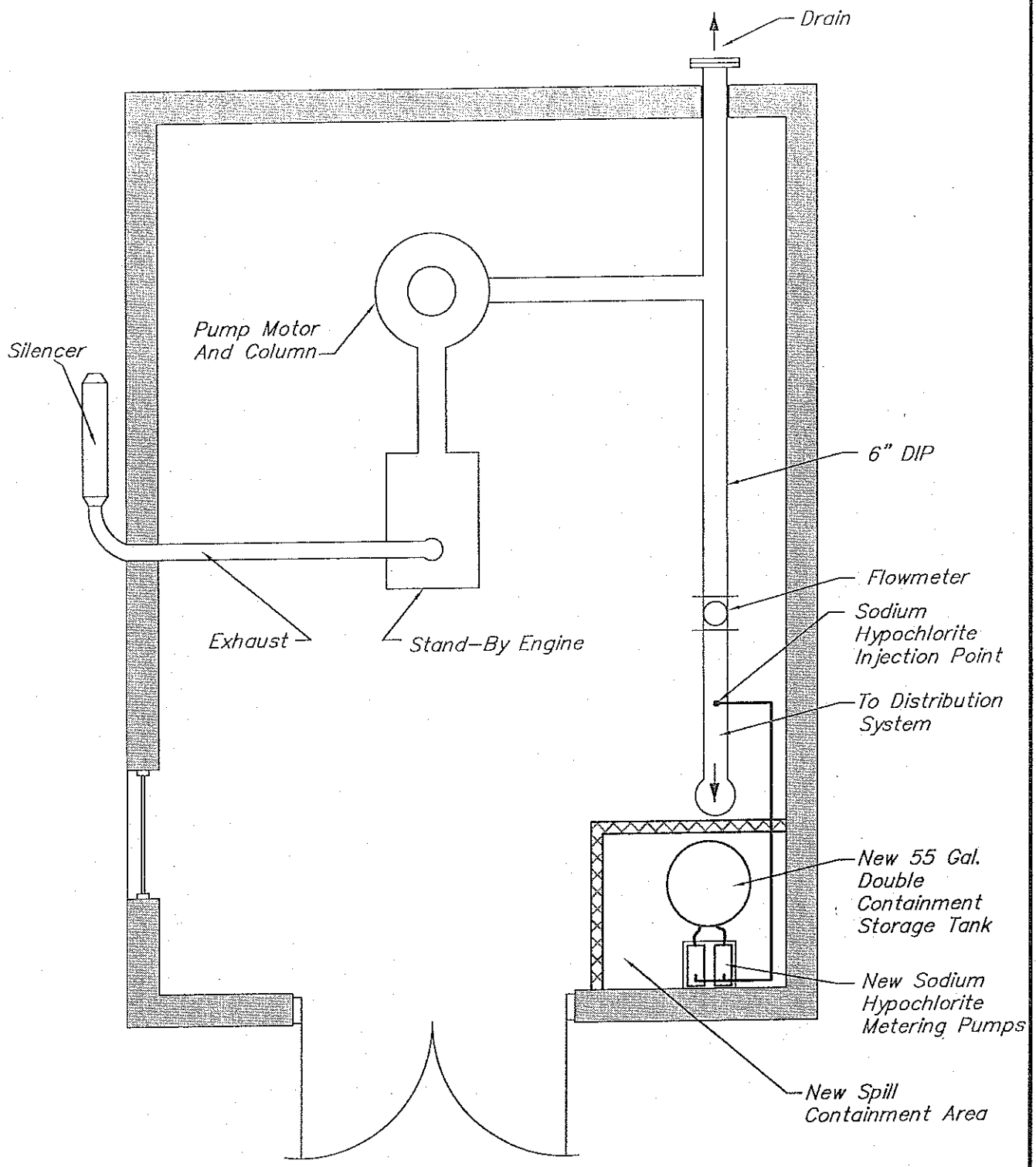
This proposed disinfection/fluoridation building will be located near these existing wells and will connect with the existing water main just prior to entering the distribution system (see **Figure 3**). This more centralized layout of this primary wellfield disinfection system would lend itself well to the addition of a fluoridation system to provide a fluorine concentration that is advantageous to the dental health of the water users. It is anticipated that fluoridation would only be provided at the new chemical feed building near the primary well field; thereby providing an adequate residual of fluorine on a system-wide basis to prevent tooth decay of the water users.

The chlorine-based proposed disinfection system will be the most cost effective for the City and preliminary costs for retrofitting the (2) outlying well houses with chlorine dosing systems and the construction of a more centralized disinfection/fluoridation system for the primary wellfield can be found in the following table.

Table 3
Preliminary Construction Costs
Well Site Disinfection/Fluoridation System

Description	Unit Cost	Quantity	Estimated Cost
Primary Well Field Disinfection/Fluoridation System			
Pre-fabricated building with HVAC and electrical	$40,000.00	1	$40,000.00
Sodium hypochlorite chemical metering pumps	$1,500.00	2	$3,000.00
Fluorosilicic acid chemical metering pumps	$1,500.00	2	$3,000.00
55-gal double containment storage tanks	$200.00	2	$400.00
Chemical feed piping (with spill containment) and injectors	$3,000.00	1	$3,000.00
New 12-inch DIP water main	$4,000.00	1	$4,000.00
Miscellaneous controls & equipment (SCADA)	$6,000.00	1	$6,000.00
Sub-Total Primary Well Field (Well #'s 5, 6 & 7):			$59,400.00
Well #4 Disinfection System			
Sodium hypochlorite chemical metering pumps	$1,500.00	2	$3,000.00
55-gal double containment storage tanks	$200.00	1	$200.00
Spill containment area for sodium hypochlorite storage	$1,000.00	1	$1,000.00
Miscellaneous controls & equipment	$1,500.00	1	$1,500.00
SCADA system improvements/programming	$2,000.00	1	$2,000.00
Sub-Total Well #4:			$7,700.00
Well #8 Disinfection System			
Sodium hypochlorite chemical metering pumps	$1,500.00	2	$3,000.00
55-gal double containment storage tanks	$200.00	1	$200.00
Spill containment area for sodium hypochlorite storage	$1,000.00	1	$1,000.00
Miscellaneous controls & equipment	$1,500.00	1	$1,500.00
SCADA system improvements/programming	$2,000.00	1	$2,000.00
Sub-Total Well #8:			$7,700.00
Sub-Total Material/Equipment Cost:			**$74,800.00**
Estimated Construction Labor/Installation Cost[5]:			$50,000.00
Engineering Design Cost (10% of Material & Labor):			$12,480.00
Contingency Cost:			$10,000.00
Total Construction Cost:			$147,280.00

[5]Bidding of project to hire outside contractor to perform all installations at one time



PROPOSED DISINFECTION SYSTEM (TYP.)
NTS

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CITY OF THREE RIVERS, MICHIGAN

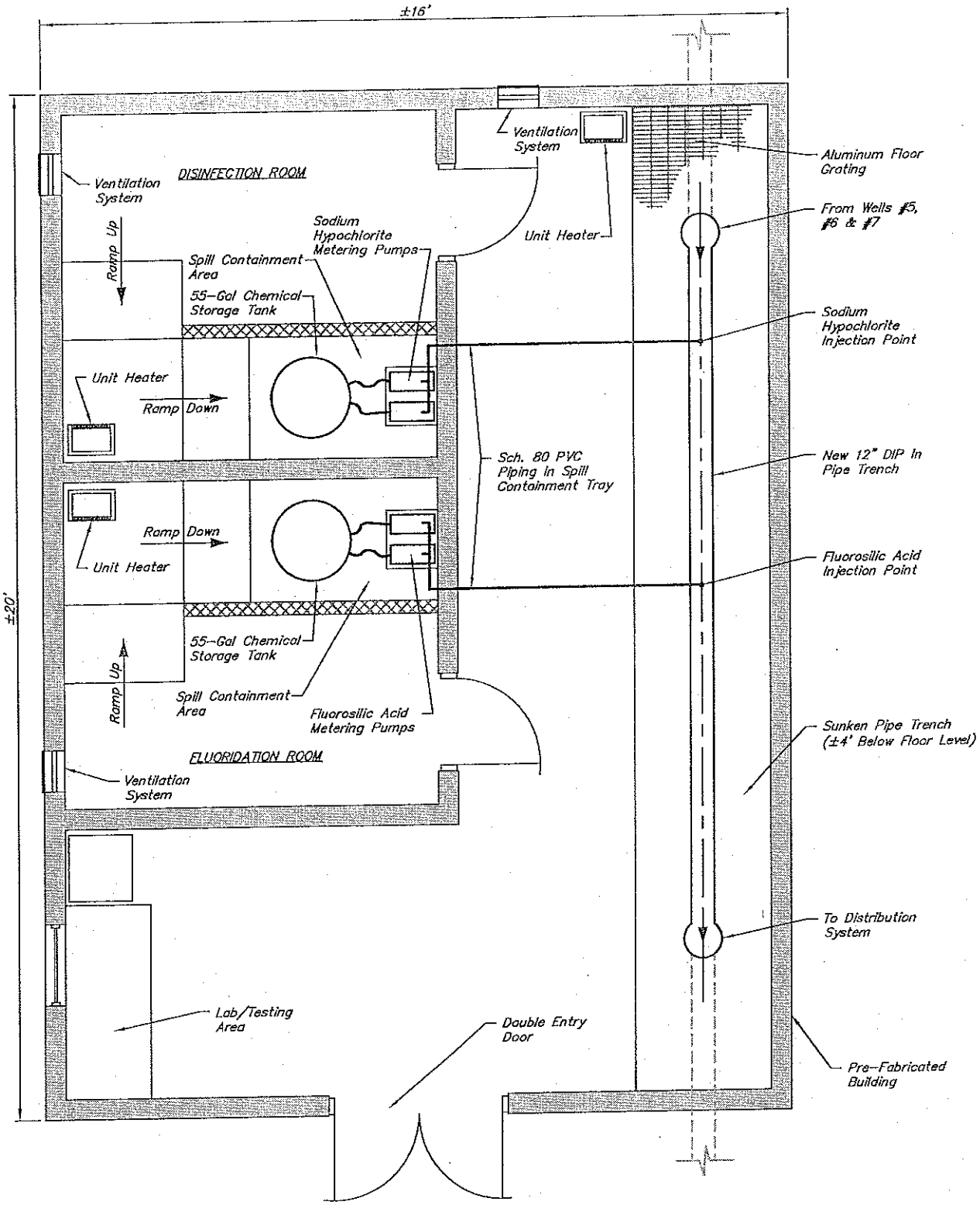
WELLS #4 & #8

WELL HOUSE DISINFECTION SYSTEM

Jones & Henry Engineers, Ltd.

FIGURE 1

AQTR-VER
12/07/05 10-V16



PROPOSED DISINFECTION/FLUORIDATION SYSTEM

NTS

CITY OF THREE RIVERS, MICHIGAN

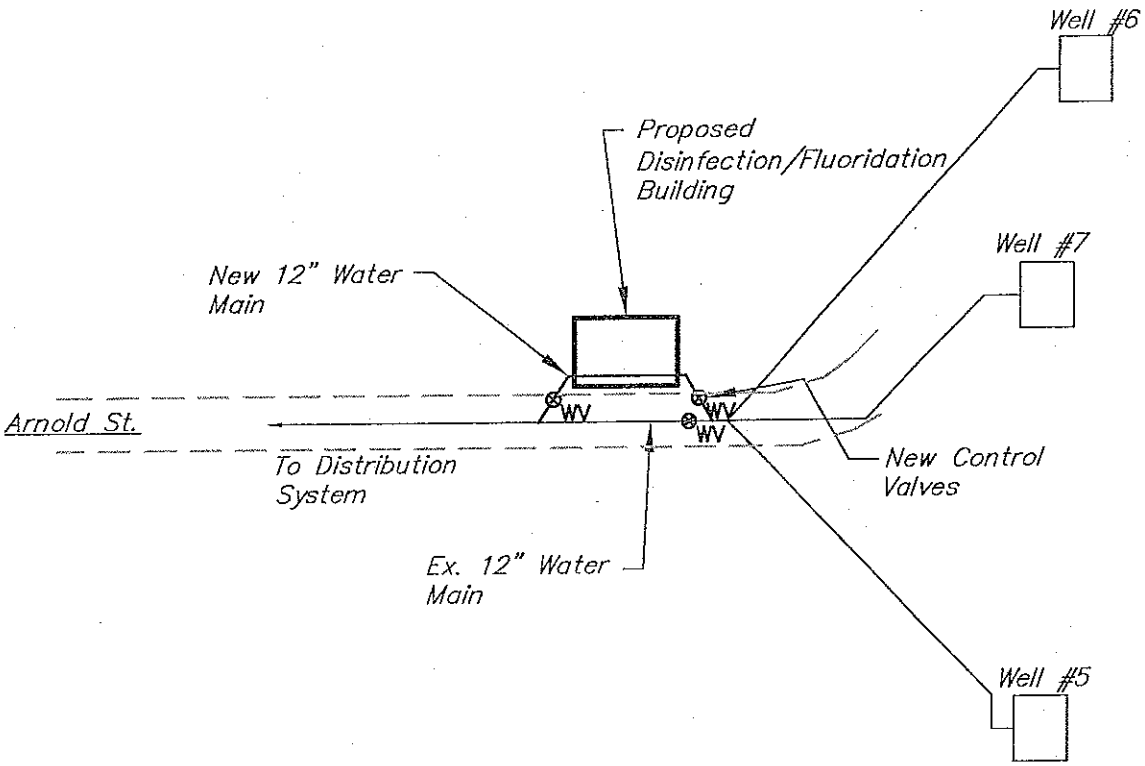
PROPOSED DISINFECTION BUILDING

WELLS #5, #6 & #7

Jones & Henry Engineers, Ltd.

FIGURE 2

AGTR-VER
12/07/05 10-Y18



CITY OF THREE RIVERS, MICHIGAN

PROPOSED DISINFECTION BUILDING SITE

WELLS #5, #6 & #7

Jones & Henry Engineers, Ltd.

FIGURE 3

AQTR-VER
12/07/05 10-V16

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
KALAMAZOO DISTRICT OFFICE

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

January 30, 2009

CERTIFIED MAIL

WSSN: 06610

Mr. Allen Balog, Mayor
City of Three Rivers
333 West Michigan Avenue
Three Rivers, Michigan 49093

Commissioners
City of Three Rivers
333 West Michigan Avenue
Three Rivers, Michigan 49093

ATTENTION: Mr. Joseph Bippus, City Manager

Dear Mayor Balog and Commissioners:

SUBJECT: Water Supply

The Department of Environmental Quality (DEQ), Water Bureau (WB), is concerned that the number and frequency of drinking water coliform standard violations occurring in the City of Three Rivers (City) water supply may warrant additional public health protection. A recent history of coliform standard violations and the possible causes, if known, include:

In September 2000, water samples confirmed total coliform bacteria in the distribution system, but our records do not show a possible cause of contamination.

In June of 2002, and July of 2002, samples confirmed total coliform bacteria in the water distribution system near the public works building. Again, a possible source of the contamination was not found.

In August of 2003, total coliform bacteria were widespread throughout the City system. Source contamination was also confirmed and it was discovered the well screen vents were not intact and millipedes were abundant in the well houses, providing a possible source for contamination.

In September of 2004, total coliform bacteria were detected in areas surrounding new water main construction activities. According to the City water quality specialist, the water main contractor had problems isolating the newly constructed main during pressure testing and disinfection.

In August of 2005, repeat samples confirmed total coliform bacteria in the water distribution system, but a possible cause was not found.

In December of 2008, the water system experienced a brief but total loss of system pressure. After a well control problem was immediately fixed, follow-up water samples indicated the presence of total coliform in the distribution system.

The Michigan Safe Drinking Water Act, 1976, PA 399, as amended (Act 399), §Sec. 15. (1) states *"When considered necessary for protection of public health, the department shall notify a supplier of water of the need to make changes in operations, to provide treatment, to make structural changes in existing systems, or to add additional capacity as necessary to produce and distribute an adequate quantity of water meeting the state drinking water standards."* The DEQ is hereby notifying the City that the number and frequency of total coliform standard violations are numerous, and the City must make changes to the water treatment system to prevent future coliform standard violations. Please provide for a plan to provide the adequate treatment of the water supply that will provide continuous protection of public health by **April 30, 2009.** Most Michigan water supplies achieve adequate water treatment by disinfecting with chlorine. Conversion of emergency chlorine equipment to provide continuous chlorine residual will require a construction permit from this department.

We are currently updating the City water system evaluation, and will forward our evaluation summary and recommendations under separate cover. If you have any questions, please call.

Sincerely,

Gary A. Wozniak, P.E., District Engineer
Kalamazoo District Office
Field Operations Division
Water Bureau
269-567-3613

GAW:DMS

cc: Mr. Jim Rozeboom, Director of Public Services, City of Three Rivers
Branch-Hillsdale-St. Joseph Community Health Agency

GAW
Greg FYI & return
6610

CITY OF THREE RIVERS

333 West Michigan Avenue
Three Rivers, Michigan 49093

Phone: (269) 273-1075
www.threeriversmi.org

February 5, 2006

Gary A. Wozniak, P.E., District Engineer,
Kalamazoo District Office
Field Operations Division water Bureau
7953 Adobe Rd
Kalamazoo, MI 49009-5026

Dear Mr. Wozniak,

On January 17, 2006, at 1pm, Jim Tolfree, Mark Glessner and I, met with members of your Department to discuss the City of Three Rivers water supply system. The DEQ was concerned about the frequency of poor water samples collected since the year 2000. Your staff highly recommended that the City begin chlorinating the water supply on a continuous basis. The DEQ feels this will add another layer of protection to the public and diminish the number of unsatisfactory water samples. The DEQ stressed the fact that the City is growing and is pushing the limit on the size of system that is mandated by law to chlorinate.

At this point in time the DEQ is not mandating that the City chlorinate. However, the DEQ feels that if additional poor samples are taken then it will order the City to chlorinate. The DEQ would prefer to have the City chlorinate voluntarily and not be forced into it.

At the conclusion of the meeting it was agreed that the City would review the option of becoming a chlorinated system and advise the DEQ on how that transition might take place. The DEQ would also listen to any other suggestions that the City had to protect the public from any potential drinking water issues.

Mark Glessner and Jim Tolfree have reviewed the situation and have proposed the following actions to alleviate your concerns:

1. City Administration will budget for the necessary equipment to chlorinate and add phosphates to its water supply at each well. This will be done in the 2006/2007 budget year.
2. Jim Tolfree begins the process of upgrading his license, so he can operate a chlorinated water system (2006).
3. We will start chlorinating our water supply a few days before, a water project that could compromise our water system, until a few days after the project is completed.

4. We will monitor construction contractors more closely.

I believe the above points should alleviate any concerns that the DEQ has with the City's water supply system. We all want to serve the public with quality services and we believe our water system is an excellent service for our constituents. If you have any further concerns please feel free to contact me at (269) 273-1075.

Sincerely,

Joseph A. Bippus
City Manager
City of Three Rivers

CITY OF THREE RIVERS

333 West Michigan Avenue
Three Rivers, Michigan 49093

Phone: (269) 273-1075
www.threeriversmi.org

April 22, 2009

Gary Wozniak
MDEQ
7953 Adobe Road
Kalamazoo, MI 49093

Re: January 30, 2009 Letter Response

Dear Gary,

The City takes exception to the DEQ's conclusion that the "number and frequency of total coliform standard violations are numerous". As your letter states there have only been 6 violations in the last 8 years or over 800 sampling events. Three of the violation's causes were determined leaving only three unexplained. The City contends that neither the number nor frequency is numerous. The City is very concern with the safety of the drinking water it provides and proposes the following Standard Operation Procedural Changes to safe guard against future total coliform violations.

1. If the water system has a pressure loss or water main break the system operator will begin chlorinating immediately and continue until safe total coliform samples are achieved.
2. If there is any water main construction attached to the water system the system will be chlorinated until the new construction is finished and total coliform tests have cleared the new watermain for use in the system.

The City greatly appreciates MDEQ's assistance in helping to safe guard the City's drinking water to provide a safe an healthy environment for our citizens. I hope MDEQ staff will seriously consider the plan put forth here for just that purpose. If you have any further recommendations please let us know.

Sincerely,

James M Rozeboom

James M Rozeboom
DPS Director

DEQ

DRINKING WATER AND RADIOLOGICAL PROTECTION DIVISION
POLICY AND PROCEDURES

NUMBER:	DWRP-03-017
SUBJECT:	COMMUNITY WATER SUPPLY SYSTEMS – REQUIRED OPERATIONS OVERSIGHT
EFFECTIVE DATE:	MARCH 4, 2002 PAGE: 1 OF 5

ISSUE:

The following policy is established to define the minimum oversight acceptable for community water supplies during standard operation and/or when the operator-in-charge leaves.

DEFINITIONS:

Community Water Supply (CWS) – A public water supply that provides year-round service to not fewer than 15 living units or which regularly provides year-round service to not fewer than 25 residents. Examples include municipalities, such as cities, villages, and townships; apartment complexes; manufactured housing communities; condominiums; and nursing homes.

Operator In Charge (OIC) – A properly certified operator who is designated by the owner of a public water supply as the responsible individual in overall charge of a waterworks system, or portion of a waterworks system, who makes decisions regarding the daily operational activities of the system that will directly impact the quality or quantity of drinking water.

AUTHORITY:

- Michigan's Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), 325.1009, Section 9, "Classification of water treatment and distribution systems; advisory board of examiners; certificates of competency; supervision of water treatment and distribution systems; individuals eligible for certificate."
- R 325.11901, R 325.11902, R 325.11905, R 325.11906a, and R 325.11906b of the Administrative Rules adopted pursuant to Act 399 covering the classification of treatment systems, classification of distribution systems, certification of operators, restricted certificates for existing operators, and notices to the Department of Environmental Quality (DEQ)

BACKGROUND:

Normally, a CWS employs an OIC to provide daily oversight and involvement in the system. However, other arrangements are acceptable for some situations. If an OIC suddenly leaves (retires, quits, etc.) a CWS, the response of the Drinking Water and Radiological Protection Division (DWRPD) regarding the CWS obtaining an OIC for short-term operation needs definition to promote effective operations and consistency.

DWRPD District and Area Engineers are able to evaluate the CWS staff with respect to the following:

1. Knowledge of waterworks operation
2. Managerial qualities

3. Current job duties and level(s) of certification
4. The CWS's plan for proper operation of the waterworks system when the OIC is not available

DWRPD staff shall implement the following policy with due consideration of items 1, 2, 3, and 4, above.

GENERAL POLICY:

The following criteria are established for both standard and short-term operation of F, D, and S classified water systems:

F-1, F-2, F-3, AND F-4 SYSTEMS

STANDARD OPERATION

Under standard operation, an OIC shall be employed on a full-time basis and be involved with and responsible for the daily operation of the water treatment plant. Full-time basis is either the traditional 40-hour work week or all hours of operation if the water treatment plant operates less than that.

SHORT-TERM OPERATION

For short-term operation when an OIC is no longer available, it is acceptable to provide the CWS time to recruit a replacement or promote a staff member to fill the OIC position. **During this interim period, the CWS must retain a temporary OIC certified at the appropriate level to visit the water treatment plant daily and be responsible for its daily operation.** The following conditions also apply:

- If the CWS desires to promote a staff member to be the OIC after the staff member has achieved proper certification, this individual must first qualify to write the appropriate certification examination when it is next offered. If this individual fails the examination, the CWS must immediately pursue the hiring of a full-time OIC.
- If the CWS does not desire to promote a staff member to be the OIC, then it must immediately pursue hiring a full time OIC. The OIC must be on staff within six months.

Short-Term Operation may only be considered if ALL of the following apply:

- The OIC leaves abruptly.
- The CWS cannot or does not immediately appoint an OIC.
- Properly certified shift operators are present.

D-1, D-2, AND D-3 SYSTEMS

STANDARD OPERATION

Under standard operation, an OIC shall be available at all times and make daily visits to the treatment plant to ensure the system is operating properly and to perform/oversee required performance/quality monitoring.

SHORT-TERM OPERATION

For short-term operation when an OIC is no longer available, it is acceptable to provide the CWS time to recruit a replacement or promote a staff member to the OIC position. **During this interim period, the CWS must retain a temporary OIC certified at the appropriate level to visit the water treatment plant at least twice per week, be on call 24 hours per day, and supervise/direct staff responsible for its daily operation.** The following conditions also apply:

- If the CWS desires to promote a staff member to be the OIC after the staff member has achieved proper certification, this individual must first qualify to write the appropriate certification examination when it is next offered. If this individual fails the examination, the CWS must immediately pursue the hiring of a full-time OIC.

- If the CWS does not desire to promote a staff member to be the OIC, then it must immediately pursue hiring a full-time OIC. The OIC must be on staff within six months.

Short-Term Operation may only be considered if ALL of the following apply:

- The OIC leaves abruptly.

- The CWS cannot or does not immediately appoint an OIC.

- The CWS has an operator with acceptable knowledge/experience to conduct daily operations under the supervision of the temporary OIC.

D-4 SYSTEMS

STANDARD OPERATION

Under standard operation, an OIC shall visit the water treatment plant weekly, be on call 24 hours per day, and supervise/direct staff responsible for daily operations

SHORT-TERM OPERATION – Same as STANDARD OPERATION, above.

S-1, S-2, AND S-3 SYSTEMS

STANDARD OPERATION

Under standard operation, an OIC shall be employed and available daily to oversee records maintenance and analysis, planning, monitoring, construction, and maintenance and to supervise/direct staff responsible for daily operations.

SHORT-TERM OPERATION

For short-term operation when an OIC is no longer available, it is acceptable to provide the CWS time to recruit a replacement or promote a staff member to the OIC position. **During this interim period, the CWS must retain a temporary OIC certified at the appropriate level to visit the CWS at least twice per week, be on call 24 hours per day, and supervise/direct staff responsible for daily operations.** The following conditions also apply:

- If the CWS desires to promote a staff member to be the OIC after the staff member has achieved proper certification, this individual must first qualify to write the appropriate certification examination when it is next offered. If this individual fails the examination, the CWS must immediately pursue the hiring of a full-time OIC.
- If the CWS does not desire to promote a staff member to be the OIC, then it must immediately pursue hiring a full-time OIC. The OIC must be on staff within six months.

Short-Term Operation may only be considered if ALL of the following apply:

- The OIC leaves abruptly.
- The CWS cannot or does not immediately appoint an OIC.
- The CWS has an operator with acceptable knowledge/experience to conduct daily operations under the supervision of the temporary OIC.

S-4 SYSTEMS

STANDARD OPERATION

Under standard operation, an OIC shall be on-site twice a month to oversee record maintenance, planning, monitoring, construction, and maintenance and to supervise/direct staff responsible for daily operations.

SHORT-TERM OPERATION – Same as STANDARD OPERATION, above.

S-5 SYSTEMS

Class S-5 systems include CWSs with no treatment and a distribution system limited in extent. The following guidelines shall be used to determine if a distribution system is limited in extent:

a) Any CWS with a distribution system comprised solely of building piping.

b) Any CWS comprised of an external buried distribution system that does not include water supply appurtenances that require maintenance such as fire hydrants, system valves, blow-off assemblies, etc.

STANDARD OPERATION

Under standard operation, an OIC shall be on-site monthly to oversee record maintenance, planning, monitoring, construction, and maintenance and to supervise/direct staff responsible for daily operations.

SHORT-TERM OPERATION – Same as STANDARD OPERATION, above.

PROCEDURE:

Responsibility	Action
DWRPD's District or Area Engineer	1. Incorporates this policy and procedure as part of the review process to determine the adequacy of OIC oversight for a CWS.
	2. This policy and procedures replaces the Michigan Department of Public Health Policy/Procedure 1993-1, dated 2/12/93.
CWS Owner	3. Notify DWRPD District or Area Engineer of changes in the status of the OIC.

APPROVED: Flint C Watt DATE: March 4, 2002
Flint C. Watt, P.E., Chief
Drinking Water and Radiological Protection Division